

as the Siegfried who overcame "the monstrous theory of *emboîtement*, not only false in itself, but one jealously guarding the problem of development and preventing all access to it." The author points to an analogy between the rise and progress of *præformationist* and Darwinian schools, which, agreed in maintaining a transformation of the simpler into the more complex have neither succeeded in demonstrating how that process is achieved.

The three lectures which remain are somewhat more special than the rest. That by Dr. Watasé on phosphorescence gives welcome support to the theory of Quatrefages that this is intimately associated with contractility, and that a common cause would appear to underlie the two processes. Dr. Watasé has been for years engaged upon this fascinating subject. His treatment of it has been no less original than that of other topics upon which he has left his mark, and we sincerely hope, now that he has returned to Japan, he will promptly give us the definitive treatise of which we are expectant. Prof. W. B. Scott, whose patient, consistent work upon the palæontology of the American Artiodactyles has for years been eagerly followed by all interested in mammalian descent, has in the lecture which he contributes to the present volume built up a masterly defence of the principle of convergence—the first comprehensive defence from the palæontological side—by lack of appreciation of which it has long been patent to anatomists that not a few of our accepted classificatory schemes and conceptions of affinity are erroneous. He deals chiefly with recent discoveries in the now famous Uinta formations, and his thesis, like the work upon which it is based, is thoroughly English in method. By contrast to the bulk of the volume before us, it comes as a set off to the too frequent indications of that "Germanising" to which our American brethren appear somewhat prone. His chief deduction that "all the strictly indigenous North American selenodonts are branches of the great tylopodan stem" is replete with interest.

Finally, there is a lengthy lecture by Prof. C. O. Whitman on "Animal Behaviour," setting forth in detail, and with comment which is exemplary in its moderation and cautiousness, a series of experiments on the phenomena of response exhibited by certain American creatures under his hand (especially a *Clepsine*, *Necturus*, and certain pigeons). He frames a thoughtful argument, which leads to the conclusion that "instinct precedes intelligence," and that its primary roots lie in "the constitutional activities of protoplasm," which, as he justly remarks, relieves us of the inconsistencies "involved in the theory of instinct as lapsed intelligence." His aphorism that "organisation shapes behaviour" would seem destined to bear the fate of his truism, "organisation precedes cell formation," now prophetic; and to him, the guiding spirit in the work which necessitated the publication of the present volume, as to all his collaborateurs, we offer our hearty congratulations. A little more work and a little less theory would be acceptable in some cases, but so long as the connection between the two is maintained to the extent exemplified in the present volume, we shall remain content.

The book closes with a series of short obituary

notices, which include those of the former Assistant Director at Wood's Holl and of the author of one of the lectures, together with a passing reference to the death of W. R. Harrington, an enthusiastic young American, well known and greatly respected on the European side of the Atlantic, who recently met his death in a second attempt to secure the young of the Bichir (*Polypterus*). G. B. H.

OUR BOOK SHELF.

Darstellung der 32 möglichen Krystallklassen. By Prof. H. Baumhauer. Pp. 36. (Leipzig: Wilhelm Engelmann, 1899.)

PROF. BAUMHAUER discusses the symmetry of crystals in accordance with recent views, and employs the axes of symmetry to distinguish the classes. Weiss and Mohs first recognised that crystals fell into seven groups depending on the relative lengths and inclinations of the crystallographic axes. The older school of crystallographers, following the lead of Naumann, commenced with the class of highest symmetry in each system, and derived the remainder by removing elements of symmetry. The logical method, as was pointed out by Gadolin, is to start with the class of lowest symmetry and add elements of symmetry until the most complicated class is reached. Each class is, in reality, quite independent of any other, even if in the same system. Groth adopted this view in the last edition of his "Physikalische Krystallographie," and rejecting all ideas of hemihedrism, introduced a nomenclature which has been here employed by Prof. Baumhauer. He, however, differs from the Munich professor, but joins Schönflies in dividing the thirty-two classes into groups depending on the axes of symmetry present. This method splits up the monoclinic system, two classes of which join the rhombic system to form the digonal group (*i.e.* the group with at least one axis of two-fold symmetry), whilst the third, which possesses a plane of symmetry only, remains by itself in the monogonal group. The triclinic class, according to the author, forms the anaxial group; Schönflies, on the other hand, splits it up and gives the holohedral class to the digonal group, and the other to the monogonal group. The latter arrangement is certainly more logical, though there is something to be said for Prof. Baumhauer's objection that a "2-zählige Spiegelachse" being in any direction, and therefore not necessarily parallel to a crystallographically possible edge, cannot be said to exist. The author follows Schönflies in placing the classes represented by phenacite and calcite respectively in the hexagonal group, whereas Groth includes them in the trigonal group. These two groups, however, might well be regarded as one.

A word must be said for the excellent diagrams, which show very clearly the symmetry of each class. At the end is given a description of illustrative models, to be obtained from Dr. F. Krantz, of Bonn.

The Essex Naturalist: the Journal of the Essex Field Club. Edited by William Cole. Vols. ix., 1895-6, and x., 1897-8. (Essex Field Club, 1899.)

THE *Essex Naturalist* has long been known as the ably conducted journal of one of the best field clubs in existence. Full accounts of the meetings and excursions of the Essex Field Club are given, and, in addition to these, any observations of interest to naturalists made within the limits of the county are recorded, and when necessary illustrated. The term naturalist is quite properly used in the very widest sense, so that the journal includes

meteorological, geological, geographical and anthropological observations, as well as others dealing with ancient marks, boundaries and buildings, customs and trades.

The journal is an excellent example of all that the organ of a field club and county natural history society should be. It fulfils a double function, recording interesting observations which would otherwise have been forgotten, and stimulating its members to make fresh efforts in their own districts. Throughout every county opportunities for observation are continually occurring, opportunities which are often wasted for want of an alert local naturalist. A fresh cutting made on a railway, a new gravel pit opened, an old house pulled down, afford the chance of interesting and often valuable observations when the keen and trained observer is on the spot. The encouragement of such work is of no less importance for the progress of science than the comprehensive papers by acknowledged leaders of their subject which appear in the *Essex Naturalist*. These would be published under any circumstances, whereas the former are rescued from the multitude of observations which might have been.

The journal is exceedingly well printed, and is a model of careful and successful editorship. E. B. P.

Anleitung zur Darstellung chemischer Präparate. Ein Leitfaden für den praktischen Unterricht in der Anorganischen Chemie. Von Prof. Dr. H. Erdmann. Second edition. 92 pp. (Frankfort: H. Bechhold, 1899.)

THE great educational value of a well-chosen set of chemical preparations, as an adjunct to the usual analytical courses, is now generally admitted; it has been, however, usual to select the examples almost wholly from the field of organic chemistry. To Prof. Erdmann is due the credit of showing that a course of inorganic preparations was not only feasible, but on account of the greater variety of difficulties met with in many cases, even preferable for educational purposes to a selection wholly organic. In this second edition several additions have been made to the original text, including the preparation of ammonium perborate, dry aluminium chloride, arsenious oxide, violet chromium sulphate and potassium iodate.

The instructions throughout are very practical, the cost of the material having been borne in mind throughout, many laboratory bye-products or residues being utilised as the raw material for preparations.

In the few instances where the methods given are not the best available, the residues are worked up in other preparations. The book as a whole fills a gap in chemical literature.

The Boyhood of a Naturalist. By Fred Smith. Pp. vi + 227. (London: Blackie and Son, Ltd., 1900.)

THIS genial account of his boyhood by a naturalist, writing under the pseudonym Fred Smith, will afford unlimited interest to any youngster with a love for live things. That Fred Smith did not shine in school, and was only with difficulty made to play cricket fairly regularly, rather adds to his winsomeness. Indirectly, the book should prove useful in demonstrating the educational value of the study of nature at first-hand. Fred's education was unmistakably of the kind which it is at present fashionable to call "heuristic," and his progress in his numerous researches is further evidence of the possibility of a boy, though considered a dunce at school, arriving at manhood educated in the better sense of the term, since his faculties are properly trained and his perceptions keenly alert. As a gift book for a child with a natural proclivity for biological work the volume can be thoroughly recommended; it is both instructive and amusing.

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LETTERS TO THE EDITOR.

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The New Zealand Zoological Region.

IN a paper on "The Geography of Mammals" (*Geographical Journal*, vol. iii. p. 95, and vol. iv. p. 35, 1894), Mr. W. L. Sclater divides the land surface of the earth into three great divisions, Notogaea, Neogaea, and Arctogaea, and these are subdivided into six regions, the Australian region corresponding with the division Notogaea. It seems to me, however, that had Mr. Sclater considered what is natural rather than what is convenient, he would have divided his Notogaea into two regions, separating the New Zealand area from that of Australia, for these two areas are essentially distinct from one another in all their great fundamental zoological characteristics. According to Mr. Sclater, Prof. Huxley and Prof. Newton make the New Zealand area a primary zoological region (I have not seen the "Dictionary of Birds" or Huxley's paper). Mr. Sclater then says: "there is, no doubt, as has just been shown, a good deal to be said for this proposal; but, on the other hand, there are even more valid reasons for retaining New Zealand as a sub-region of the Australian region." Mr. Sclater then states his "more valid regions," which are three in number. The first is that as he is dealing with mammals only it would be absurd to give a small group of islands, which is almost entirely without terrestrial mammals, the rank of a primary region. Had Mr. Sclater therefore left the New Zealand area out of his considerations altogether, as was wisely done by Mr. P. L. Sclater in his lecture "The Geographical Distribution of Mammals" (Manchester Science Lectures, No. 5, Sixth Series, 1874), I should have been entirely in accordance with him, and there would have been no occasion for this paper.

The second reason given is that of "practical convenience." It seems to me, however, that convenience should only be a secondary consideration, and that what is natural is far more important. Mr. Sclater goes on to say that "other small insular areas might with some justice put forward nearly similar claims."

New Zealand, however, stands alone in its very remarkable physical and biological conditions, and presents with those of Australia the strongest contrasts rather than similarities.

It is, however, to Mr. Sclater's third reason that I have more especially to take exception. He says: "Although New Zealand possesses no indigenous terrestrial mammals, yet the fauna, such as it is, shows an unmistakable affinity of various degrees to that of Australia, and more especially to the tropical parts of that continent. It is, indeed, probable that the whole of the fauna of New Zealand has been originally derived from that source."

There are no doubt affinities between the faunas of Australia and New Zealand; but when we consider that in Tertiary times (probably Pliocene) the New Zealand land area extended far to the north and west of its present limits, probably as far as Lord Howe Island, and the facilities for the diffusion of species from the one area to the other were immensely greater than they are at present, the wonder is that these affinities are so slight and insignificant. It has been usual to look for similarities in the faunas, and to attach much importance to the occurrence of the same or representative species in both areas, and the great and essential differences of the faunas as a whole have been largely lost sight of or little understood.

I would first remark that the presence in Australia of a rich mammal fauna (marsupials and monotremes), and its total absence from New Zealand, is certainly significant. But let that pass, and, as Mr. Sclater has himself suggested, to determine the geographical affinities of New Zealand we must take "the fauna such as it is," consisting of birds, reptiles and other lower groups; and when we do this we find that the result is exactly opposite to what Mr. Sclater would lead us to expect.

Prof. Newton has no doubt ably dealt with the affinities of the New Zealand birds in his work, "Dictionary of Birds"; I need not therefore discuss them here, except to remark that one of the most interesting and remarkable features of our bird fauna is the fact that during recent times—at most a few hundred years back—there existed in these lands numerous species of